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Composite Layering Technique for use in a Eulerian Shock Physics Code SHANE SCHUMACHER, Sandia National Laboratories — The high strength and low density of fiber reinforced composites have made them applicable to high strain rate shock environments. The modeling and simulation of such materials is difficult due to their anisotropic behavior and complex internal geometries. Fiber reinforced composites consist of a collection of layers that create a laminate. Each layer is typically transverse isotropic or orthotropic consisting of a fiber and matrix material. The creation of a layering capability in a Eulerian shock physics code can mitigate the burden of smearing and increase the accuracy of modeling fiber reinforced composites. This process is done using a sub-grid technique in an individual grid cell. The grid cell is partitioned based on layer location in the laminate and the material deformation. The volume occupied by a layer is computed and the layer computes a material response based on the cell strain field. The resulting state variables are volume weighted with the remaining layers in the given grid cell yielding a cell response. The result is a technique that requires less computation time than modeling each layer and increases the accuracy over smeared approximations.

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